A Few Points on the Michelson-Morley Experiment

by

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I have read the description of the Michelson-Morley experiment given in "The Feynman Lectures on Physics", Volume 1. The scheme of the experiment is depicted in the following figure (Fig. 1).

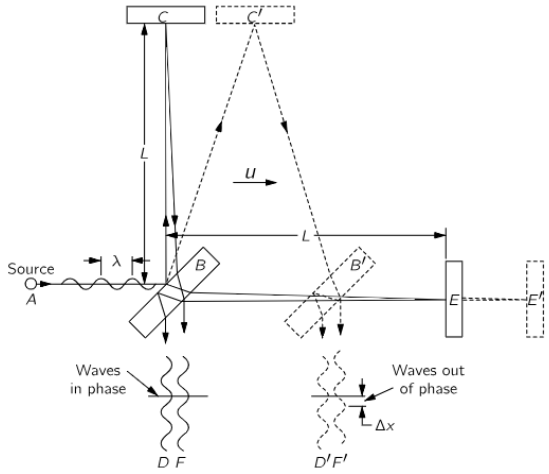

Fig. 1: Schematic Diagram of the Michelson-Morley Experiment (Reproduced from "The Feynman Lectures on Physics", Volume 1) (*B* is a silvered glass plate, and *C* and *E* are two mirrors.)

It appears from the description that one could also use bullets instead of light to measure the velocity of the earth with respect to ether. That too would give us similar expressions for the time of travel of the bullets along the direction of motion of the earth and for that perpendicular to the direction of motion of the earth. Then again, it is difficult to understand why the velocity of the earth with respect to ether could not be measured. The reason is as follows. It is not necessary to consider the light (or the bullet) travelling in the direction perpendicular to the direction of motion of the earth. Considering the travel of light (or bullet) along the motion of the earth in the direction of its motion and that opposite to its direction of motion, we have

$$c - u = \frac{L}{t_1} \ldots (1)$$

$$c + u = \frac{L}{t_2} \ldots (2),$$

where c is the absolute speed of light (or bullet) (with respect to ether),

u is the absolute speed of the earth (with respect to ether),

L is the distance between the source of light (or bullet) and the mirror placed along the direction of motion of the earth,

t_1 is the time taken by the light (or the bullet) to travel from its source to the mirror in the direction of the motion of the earth,

t_2 is the time taken by the reflected light (or bullet) to travel from the mirror back to the source in the direction opposite to that of the motion of the earth.

If t_1 and t_2 are measured, then we can solve equations (1) and (2) for c and u. From this discussion, it also follows that the absolute velocity of a car can be measured by similar means by an observer sitting inside it.